

STUDIES IN EUPATORIUM (COMPOSITAE)
I. REVISION OF EUPATORIUM BELLIDIFOLIUM
AND ALLIED SPECIES

J. L. GRASHOFF AND J. H. BEAMAN¹

Eupatorium bellidifolium Benth. is the earliest described member of a closely allied complex of herbaceous Mexican and Central American species of section *Eximbricata*. The complex also includes *E. lasium* Robins., concerning which Robinson (1923) noted that "This beautifully distinct species belongs in a small group striking by reason of their loose inflorescence." Three other species which he included in the group (Robinson 1923; 1934) are *E. muelleri* Sch. Bip. ex Klatt, *E. choricepalum* Robins., and *E. arsenei* Robins. During an examination of various Mexican and Central American species of *Eupatorium* in the Gray Herbarium and the U. S. National Herbarium a collection from Honduras determined as *E. muelleri* came to our attention. It appeared to be misdetermined but nevertheless belonged with the complex. In connection with the study of this and several similar specimens, which are here described as a new species, we have found it desirable to review the group as defined by Robinson and to prepare a revision of these species.

Although Robinson's conclusion that the species are closely related seems well justified, they do not appear to be as sharply delimited from other species of *Eupatorium* as his statement concerning the loose inflorescence might imply. Their relatedness is suggested also by the herbaceous habit,

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generally cordate leaves with dentate or crenate margins, corollas with ampliate throats, the shape, size and pubescence of the achenes, and brittle pappus. But these characters individually or collectively do not afford a clear distinction of the group. Still other species which are not distantly related include *E. pazcuarensis* H.B.K., *E. rothrockii* A. Gray, *E. mariarum* Robins., *E. aschenbornianum* Schauer, and *E. ciliatum* Less. An investigation of all such species, however, is at present beyond practical limits.

KEY TO THE SPECIES

1. Pedicels and outer phyllaries glabrous 2
1. Pedicels and/or outer phyllaries pilose or with glandular trichomes 3
 2. Leaves cordate, crenulate, extending well up the stem into the inflorescence although gradually reduced upward; heads less than 7 mm wide, with ca 50 florets 1. *E. anchisteam*
 2. Leaves ovate to orbicular, acuminate, cuneate or truncate, seldom cordate, confined to the lower 1/4 of the plant, or if present above then much reduced; heads 6-9 mm wide, with ca 85-125 florets 2. *E. muelleri*
3. Inflorescence branches, pedicels, and outer phyllaries with glandular trichomes; leaves subrosulate; phyllaries linear; heads few on long pedicels 3. *E. bellidifolium*
3. Inflorescence branches, pedicels, and outer phyllaries with non-glandular trichomes, phyllaries lanceolate to ovate; heads few to many, usually on short pedicels 4
 4. Leaf blades with nerves branching from above the base, with large white moniliform trichomes on both surfaces; head ca 8 mm wide, with 60-87 florets 4. *E. lasium*
 4. Leaf blades with nerves branching at the very base, often appearing glabrous at least on the lower surface; heads 5-7 mm wide, usually with 30-60 florets 5. *E. choricephalum*

1. *Eupatorium anchisteam* Grashoff & Beaman, sp. nov.

Type: HONDURAS. MORAZAN: region of El Jicarito, above El Zamorano, 900-1000 m, *Paul C. Standley* 27471, Nov. 14, 1950 (US 2024848, holotype, MSC photo 9237; GH).

Herba perennis erecta, 4-6 dm alta. Caulis gracilis, basi densissime cum sordidis trichomatibus duplo-pilosus. Folia opposita membranacea, superne gradatim parvescentia. Petioli 1.5-3 cm longi, duplo-pilosi. Laminae 2.5-5 cm latae, 3.5-5 cm longae, orbiculari-ovatae, acuminatae, cordatae, crenatae ad crenulatae, utrinque sed praecipue inferne secus venas cum tricomatibus moniliformibus grandibus albidis, 3-7

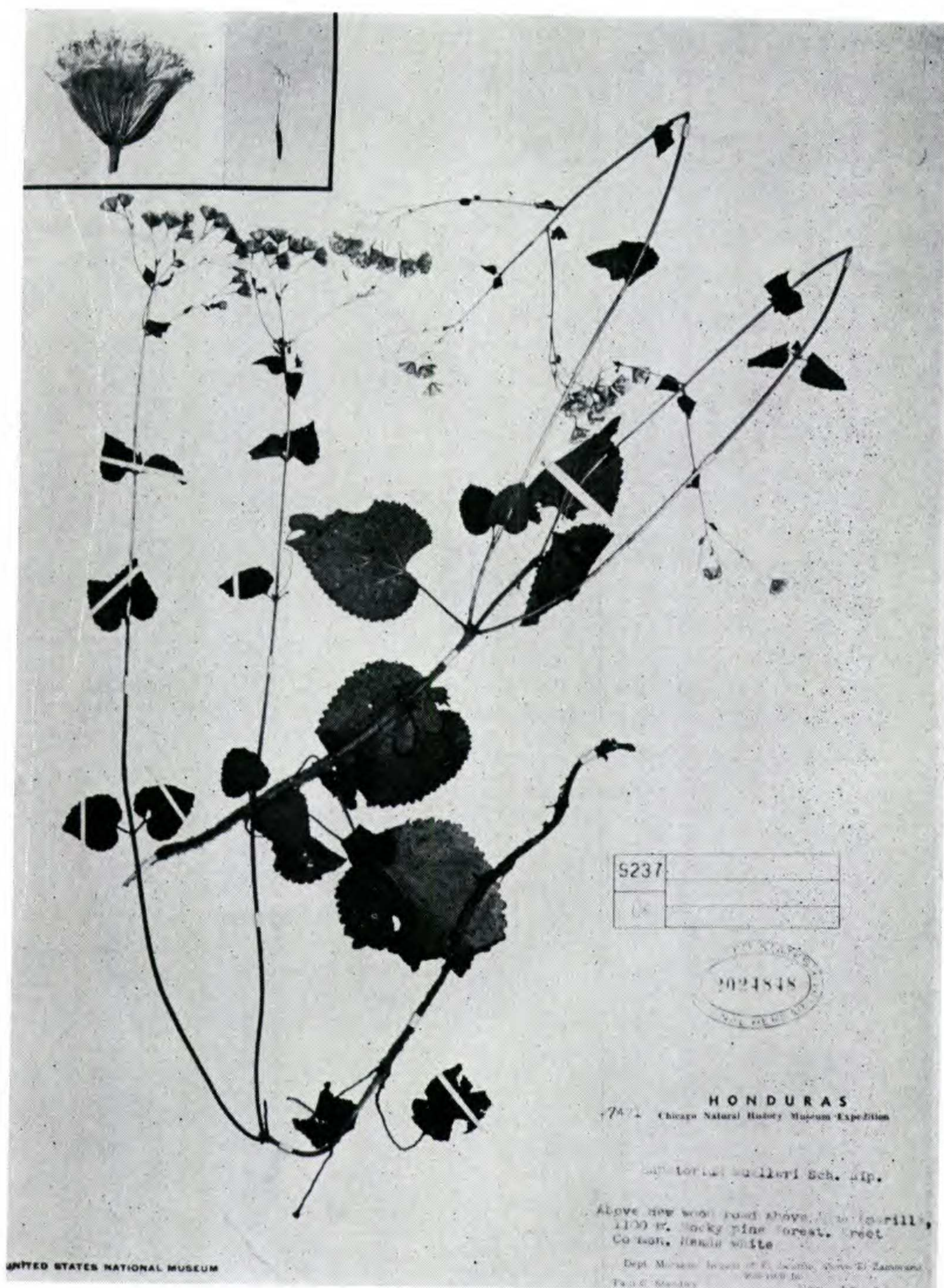


Plate 1429

Figure 1. *Eupatorium anchisteum* Grashoff & Beaman, holotype. Insert: head and floret from *Steyermark* 30650 (F). Many of the fragile pappus bristles have fallen away ($\times 2.2$).

nervis a brevi-acuminatae basi maxime diffusis. Inflorescentia in paniculam terminalem laxè disposita, ramis subglabratiss, pedicellis 7-15 mm longis. Capitula 5 mm alta, cum ca 50 flosculis. Involucra campanulata. Phyllaria ca 20-22, obtusa ad acuta, subaequaliter herbacea, glabra, lanceolato-ovata ad oblanceolato-obovata, scarioso-marginata, ciliata. Corollae ca 2.7 mm longae, albae, ad lobulos pubescentes, lobuli 0.5 mm longi. Achaenia nigra, ca 1.5 mm longa, praecipue secus venas cum trichomatibus bifidis. Setas pappi multae, albae, barbellatae, fragiles, 3 mm longae.

Erect perennial herb 4-6 dm tall; stem slender, terete, densely doubly pilose below with grayish trichomes; leaves opposite, membranaceous, becoming gradually smaller above; petioles 1.5-3 cm long, doubly pilose; blades 2.5-5 cm wide, 3.5-5 cm long, orbicular-ovate, acuminate, cordate, crenate to crenulate, with white moniliform trichomes on both surfaces and especially along the veins beneath, veins 3-7, branching from the short-acuminate base; inflorescence a loose terminal panicle, the branches subglabrous, pedicels 7-15 mm long; heads ca 5 mm high, 6-7 mm wide, with ca 50 florets; involucre campanulate, phyllaries 20-22, obtuse to acute, subequal, herbaceous, glabrous, lanceolate-ovate to oblanceolate-obovate, scarious margined, ciliate; corollas 2.7 mm long, white, pubescent on and near the lobes, lobes 0.5 mm long, achenes black, ca 1.5 mm long, with bifid trichomes especially along the ribs; pappus of numerous fragile white barbellate bristles 3 mm long. Figure 1.

Additional specimens examined. GUATEMALA: CHIQUIMULA: along Rio Tacó between Chiquimula and Montaña Barriol, 3-15 mi NW of Chiquimula, 500-1200 m, *Steyermark* 30650 (F). JALAPA: mountains along the road between Jalapa and Paraíso, 1400-1700 m, *Standley* 77248 (F); vicinity of Jalapa, 1360 m, *Standley* 76538 (F); Cerro Alcoba, just east of Jalapa, 1300-1700 m, *Steyermark* 32577 (F). SACATEPÉQUEZ: near Antigua, 1500-1600 m, *Standley* 58628 (F). CHIMALTENANGO: Alameda, *Johnston* 356 (F); along road from Chimaltenango to San Martín Jilotepeque, 1500-1900 m, *Standley* 57980 (F); near Finca La Alameda, near Chimaltenango, 1830 m, *Standley* 59096 (F). HONDURAS. MORAZÁN: San Antonio, *Rodriguez* 1458 (F); El Quebracho above El Zamorano, ca 950 m, *Standley* 377 (F); along and near Río Agua Amarilla above El Zamorano, 1000-1200 m, *Standley* 13837 (F); along Río Agua Amarilla above El Jicarito, 900-1100 m, *Standley* 27320 (F). EL PARAÍSO: near cumbre of Yuscarán Road, 1450 m, *Standley* 29294 (F).

Irregularities in pollen production in *Eupatorium anchistaeum* suggest that it may be apomictic. Pollen was not observed in any specimens of this species. At anthesis the contents of the anthers resemble oil droplets of varying sizes which apparently lack an exine. Full fruit set never-

theless occurred in many of the specimens. Two previous investigators (Holmgren 1919; Sparvoli 1958, 1960) have demonstrated apomixis in species of *Eupatorium* in which fruit was set despite abortive pollen.

The following specimens of *E. anchisteum* have pre-anthesis florets with the anthers devoid of recognizable pollen grains, the contents instead resembling oil droplets: *Johnston* 356 (F); *Rodriguez* 1458 (F); *Standley* 377 (F), 27320 (F), 76538 (F), 77248 (F); *Steyermark* 30650 (F). The following specimens have no pre-anthesis florets but an examination of post-anthesis florets revealed "oil-droplets": *Standley* 27471 (MSC), 57980 (F), 58628 (F), 59096 (F).

Specimens of *E. anchisteum* have been determined previously as *E. muelleri*, and it is to this species that *E. anchisteum* seems most closely related. The specific epithet *anchisteum* (Gr. next of kin) is meant to express this relationship. There is no indication of intergradation between the two taxa, however, even though they overlap in range and appear mixed in a single collection. There are very clear morphological differences between them, which we believe justify recognition of the two taxa as species.

Although *E. anchisteum* is most similar to *E. muelleri*, it also has features in common with *E. aschenbornianum* and *E. choricepalum*. From the former it may be distinguished by the glabrous phyllaries as well as fewer heads on longer pedicels (hence a more lax inflorescence). The pubescence at the base of the stem of *E. aschenbornianum* is reddish whereas that in *E. anchisteum* is usually white; thus the stems of *E. aschenbornianum* appear tawny when dried while those of *E. anchisteum* have a grayish appearance. The densely pilose stem, the presence of large moniliform hairs on the leaves, and the glabrous outer phyllaries of *E. anchisteum* distinguish it from *E. choricepalum*.

2. *Eupatorium muelleri* Sch. Bip. ex Klatt

Eupatorium muelleri Sch. Bip. ex Klatt, *Leopoldina* 20: 90. 1884. Type: MEXICO. OAXACA (?): "Tala." *Liebmann* 67 (C, holotype, MSC photo 4578; GH).

Mallinoa corymbosa Coult. Bot. Gaz. 20: 47. 1895. Type: GUATEMALA. SANTA ROSA: Volcan Jumaytepeque, 6000 ft, *Heyde & Lux ex J. D. Smith* 4255 (F, holotype, MSC photo 9149; US).

Erect perennial herb 30-60 cm high; stems terete, striate, purple, rather densely doubly pilose below, becoming glabrous above; leaves opposite, confined to the lower 1/4 of the plant, sometimes subrosulate (upper leaves, when present, much reduced and short-petiolate to subsessile); blades 25-80 mm long, 10-60 mm wide, ovate to ovate-rhomboid (occasionally suborbicular), acuminate, truncate to cuneate-acuminate at the base, 3-7 nerved, sparsely pubescent on both surfaces with large moniliform trichomes especially along the nerves below; inflorescence an open, few-headed corymb; heads 4-6 mm high, 6-9 mm wide, with 85-125 florets, on long glabrous pedicels up to 7.5 cm long; involucre campanulate, phyllaries biseriate, subequal, glabrous, ovate, obtuse to acute, scarious margined, ciliate; corollas white, lobes pubescent; achenes 1.5 mm long, hispid especially along the ribs; pappus of brittle white barbellate bristles 3.5 mm long.

Specimens examined. MEXICO. JALISCO: km 926-927 on Mex 80 from Guadalajara to Barra de Navidad, *Grashoff* 188 (MSC); steep mountainsides 3-5 road miles above (north of) La Cuesta, road to Talpa de Allende; elevation 950-1000 m, *McVaugh* 21246 (MICH); cultivated from seed of the preceding, *Grashoff* 277 (MSC). HIDALGO: Tulancingo, ravine near Apulco, 2200 m, *Moore* 2098 (GH). STATE OF MEXICO: Dist. of Temascaltepec, Cajones, 2480 m, *Hinton* 2374 (US); Tejupilco, 1340 m, *Hinton* 2710 (F, GH, US). MICHOACAN: Uruapan, 4500 ft., *Pringle* 10121 (F, GH, MSC, US). GUERRERO: Mina, Toro Muerto, 2350 m, *Hinton et al.* 14764 (MICH, US). OAXACA: Sierra de San Felipe, 7500 ft, *Pringle* 6055 (GH, MSC, US); 16 km al NE de Oaxaca sobre la carratera a Ixtlan de Juarez, *Rzedowski* 19214a (MSC); Cerro de San Felipe, 6000-7000 ft, *C. L. Smith* 305 (F). OAXACA (?): Tala [Talea?], *Liebmann* 67 (C, holotype; GH). CHIAPAS: one mile N of Junction of Mex 195 and Mex 190 on Mex 195, *Grashoff* 236 (MSC). GUATEMALA. HUEHUETENANGO: along road E of San Sebastián, ca 1800 m, *Standley* 81454 (F); near crossing of Río San Juan Ixtlán E of San Rafael Pézsal, ca 1730 m, *Standley* 83060 (F). CHIQUIMULA: along Río Tacó between Chiquimula and Montaña Barriol, 3-15 miles NW of Chiquimula, 500-1200 m, *Steyermark* 30641 (F). JALAPA: vicinity of Jalapa, 1360 m, *Standley* 76696 (F); Montaña Durazno, 2 mi E of San Pedro Pinula, 1400-1800 m, *Steyermark* 32976 (F). CHIMALTENANGO: Alameda, *Johnston* 493 (F); Barranco de La Sierra, SE of Patzún, ca 2100 m, *Standley* 61602. SANTA ROSA: Volcán Jumaytepeque, 6000 ft, *Heyde & Lux ex J. D. Smith* 4255 (F, holotype of *Mallinoa corymbosa*; US). HONDURAS. COMAYAGUA: vicinity of Siguatepeque, 1080-1400 m, *Standley* 56032 (F). MORAZÁN:

along and near Río Agua Amarilla, above El Zamorano, 1000-1200 m, *Standley* 13837.

The relationships of *E. anchisteam* and *E. muelleri* are discussed under the former species. Like *E. anchisteam*, *E. muelleri* appears to be apomictic. The following specimens of *E. muelleri* have pre-anthesis florets with anthers devoid of recognizable pollen grains, the contents instead resembling oil droplets; *Grashoff* 188 (MSC), 236 (MSC), 277 (MSC); *Hinton* 2710 (F); *Pringle* 10121 (MSC); *Standley* 77626 (F); *Steyermark* 30641 (F). The following specimens have no pre-anthesis florets but an examination of post-anthesis florets revealed "oil droplets": *Johnston* 483 (F); *Standley* 50632 (F), 61602 (F), 81454 (F). One specimen (*Standley* 83060, F) contained only post-anthesis florets with anthers which appeared totally empty.

When grown in the experimental garden and greenhouse, plants of *E. muelleri* exhibit a more robust habit than those in the native habitat. They achieve a higher stature (to one meter), have a greater degree of branching, and have leaves distributed farther up the stem. They maintain, however, the large heads in open inflorescences and the characteristic leaf shape of the species.

Eupatorium muelleri is very similar to *E. lasium*, from which it is readily separated only by its glabrous pedicels. In other respects the two species appear to intergrade or to form two extremes of a continuum. *Eupatorium lasium* usually has a more robust habit with a much-branched inflorescence and a greater number of smaller heads. The specimens now referred to *E. lasium* may be local isolates of the more widespread *E. muelleri*, but such a conclusion would have to be reinforced by more extensive collections than are now available.

3. *Eupatorium bellidifolium* Benth.

Eupatorium bellidifolium Benth. Pl. Hartweg. 43. 1840. Type: MEXICO. HIDALGO: mountains near Apulco, *Hartweg* 330 (K, holotype, MSC photo 1644).

Erect scapose perennial herb 15-35 cm tall; stems terete, sparsely doubly pilose below, glandular and pilose above; leaves subrosulate,

opposite, petiolate, reddish beneath; blades obovate-orbicular, 1-6 cm long, 0.8-4 cm wide, crenate or serrate, base subcuneate-acuminate, with 3-7 nerves branching from a short distance above the base (occasionally appearing to branch directly from the base, particularly in depauperate specimens), pilose with large moniliform trichomes on both surfaces, especially along the veins beneath; inflorescence a diffuse, few-headed corymb, occasionally with but two or three heads; pedicels densely pubescent with both glandular and eglandular trichomes; heads with 40-100 florets, 8-10 mm wide, 6-8 mm high; involucre campanulate, phyllaries virescent, lanceolate to linear-lanceolate, acuminate, subequal, 2- (3-) ribbed, 3-nerved, the outer with glandular trichomes; corollas white, 4 mm long, glabrous except on the lobes; achenes dark brown, 1.5-2.0 mm long, hispid especially along the ribs; pappus of brittle white barbellate bristles 3 mm long, sometimes reddish.

Specimens examined. MEXICO. SINALOA: Sierra Madre Occidental, in forest at Loberas summit, 6350 ft. *Goodman* 7420 (US); Sierra de la Durango, Cerro de las Cruces, San Ignacio, 2160 m, *Montes & Salazar* 105 (US). JALISCO: Sierra del Halo, near lumber road leaving the Colima highway, 7 miles SSW of Tecalitlán and extending southeasterly to San Isidro, 1700-1800 m, *McVaugh & Koelz* 1285 (MICH). HIDALGO: mountains near Apulco, *Hartweg* 330 (K, holotype). STATE OF MEXICO: Temascaltepec, Cumbre-Cruz, *Hinton et al.* 8688 (F, GH, US). MICHOACAN: Zitacuaro, Cerro Aguila, 2750 m, *Hinton et al.* 13555 (GH, MICH, US). GUERRERO: Cruz de Ocote, ca 25 km WSW of Camolta, Mun. de Chichihualco ca 50-60 km W of Chilpancingo, *Fedema* 2879 (MICH); *idem loc.*, *Rzedowski* 14945 (MICH); Cerro Alquitrán cerca de Mazatlán, municipio de Chilpancingo, *Rzedowski* 23663, (MSC); Mina, Campo Marado, 2420 m, *Hinton et al.* 11171 (GH, US); Cerro Azul, 2500 m, *Hinton et al.* 14945 (MICH, US). OAXACA: near first summit of road about 9 miles NE of Mitla on the road to San Lorenzo, 8000 ft, *Ernst & Delgadillo* 2228 (US); cultivated from seed of the preceding, *Grashoff* 276 (MSC); Ixtlan de Juárez, *Kruger & Gillespie* 44 (GH); Sierra de San Felipe, 8000 ft, *Pringle* 6056 (GH, MICH, MSC, US); Sierra de Clavellinas, 8000 ft, *C. L. Smith* 367 (F, US); 16 km NE of Oaxaca, sobre la carretera a Ixtlan de Juárez, *Rzedowski* 19214 (MICH). CHIAPAS: near Piedracitos 7 km E of San Cristobal las Casas, Mun. of Chamula, 7200 ft, *Breedlove* 8005 (MICH). GUATEMALA. ZACAPA: between Loma El Picacho and Cerro de Monos, 2000-2600 m, *Steyermark* 42760 (F).

Three specimens were examined for anther content. Two had pre-anthesis florets with anthers completely devoid of any recognizable pollen grains, the contents instead resembling oil droplets. These were: *Grashoff* 276 (MSC), *Rzedowski* 23633 (MSC). *Pringle* 6065 (MSC) contained only post-

anthesis florets but an examination of the anthers revealed few pollen grains and many "oil droplets".

4. *Eupatorium lasium* Robins.

Eupatorium lasium Robins. Contr. Gray Herb. 68: 21. 1923. Type: MEXICO. MICHOACAN: vicinity of Morelia, vers la Loma de la Huerta, 1950 m, *Arsène* 5788 (GH, holotype, MSC photo 5980; US).

Erect perennial herb 5-6 dm or more tall; roots of 6-12 gray-black fibrils ca 2 mm thick; stems terete, ca 5 mm thick at base, densely doubly pilose below, becoming sparsely and singly pilose above; leaves opposite, long-petiolate, ovate, broadly cordate, short-acuminate, coarsely crenate to obtusely dentate; blades white-pilose on both surfaces with large moniliform trichomes, 3-7 cm long, 2.7-6 cm wide, 3-7-nerved from just above the acuminate base; petioles sometimes winged; inflorescence a lax panicle, bracts foliaceous but much reduced, pedicels 5-18 mm long, short pubescent; heads about 8 mm high, 8 mm wide, with 60-87 florets; involucre campanulate; phyllaries 23-30, subequal, lanceolate to oblanceolate, obtuse to acute, scarious margined, the apex long ciliate; corollas white, throat and/or lobes pubescent, throat enlarged, cylindrical, lobes ca 1.8 mm long, deltoid; achenes black, ca 1.8-2.2 mm long, hispid especially along the ribs; pappus of thin brittle white barbellate bristles ca 4 mm long.

Specimens examined. MEXICO. MICHOACAN: vicinity of Morelia, vers la Huerta, 1950 m, *Arsène* 5440 (US); *Arsène* 5788 (GH, holotype; US); Loma Santa Maria, 1950 m, *Arsène* 5867 (US); Cerro San Miguel, 2100 m, *Arsène* 7272 (US); Cerro Azul, 2100 m, *Arsène* 7275 (US).

5. *Eupatorium choricepalum* Robins.

Eupatorium choricepalum Robins. Proc. Amer. Acad. 54: 239. 1918. Type: MEXICO. JALISCO: near Guadalajara, *Pringle* 11824 (GH, holotype; F, MICH, MSC, US).

Eupatorium arsenei Robins. Contr. Gray Herb. 104: 10. 1934. Type: MEXICO. MICHOACAN: vicinity of Morelia, Car-rindapaz, *Arsène* 6080 (GH, holotype, MSC photo 5928; US).

Erect or slightly decumbent perennial herb about 1 m tall; stems terete, often purplish, doubly pilose below, singly pilose above; leaves opposite, petiolate, becoming sessile and reduced above, broadly ovate, acuminate, broadly cordate to truncate at the base, crenate, the base of the blade acuminate at the insertion of the petiole, blade ca 3-7.5 cm long, 2.5-6 cm wide, thin, sparsely pilose on the veins with small trichomes, appearing glabrous without magnification, veins 3-8,

separating at the very base of the blade; inflorescence usually an open panicle but clusters of heads sometimes remote; pedicels filiform, 3-18 (-25) mm long, pubescent; heads 5-6.5 mm long, 5-7 mm wide, with 30-60 (-84) florets; involucre campanulate, phyllaries virescent, subequal, oblong to linear-lanceolate or linear-oblong, obtuse, acute, or often acuminate, 2-ribbed, 3-nerved, scarious margined, ciliate, the outer dorsally pilose; corollas white, throat ampliate, lobes 0.3-0.9 mm long; achenes dark brown, 1.5-2 mm long, hispid especially along the ribs; pappus bristles white, short barbellate, brittle, 4 mm long.

Specimens examined. MEXICO. CHIHUAHUA: "South-western Chihuahua," *Palmer* 276 in 1885 (GH, US), Mapula Mts., *Pringle* 747 (GH, MICH, MSC). SINALOA: San Ignacio, San Juan, Lasbreas, *Ortega* 6885 (F). DURANGO: city of Durango and vicinity, *Palmer* 857 in 1896 (F, GH, MSC, US). NAYARIT: mountains 10 miles SE of Ahuacatlan on the road to Barranca del Oro and Amatlan, 1100-1300 m, *McVaugh & Koelz* 782 (MICH). JALISCO: Barranca de San Juan de Dios ca 15 km E of Pihuamo, eastern slopes of Sierra de los Corales, Mun. de Tecalitlan, 1200-1300 m, *Feddema* 2201 (MICH); Sierra del Tigre, 3 miles S of Mazamitla, 2100-2200 m, *McVaugh* 13605 (MICH); *McVaugh & Koelz* 418 (MICH); *McVaugh & Koelz* 419 (MICH); Sierra de la Campana along road to Mascota 7-8 miles NW of Los Volcanes, 1900-2000 m, *McVaugh* 13692 (MICH); steep mountainsides 4.5 miles NNE of Talpa de Allende N of the road, 1450-1500 m, *McVaugh* 20203 (MICH); mountains 12-15 miles SSE of Autlan on lumber road to Corralitos, 4-10 miles above (SE) Ahuacapan, 1500-2000 m, *McVaugh & Koelz* 998 (MICH); in the barranca at Puente San Pedro, 5 miles SW of Tecalitlan, 1200 m, *McVaugh & Koelz* 1310 (MICH); Chalapa, *Palmer* 712 in 1886 (GH, MICH, MSC, US); near Guadalajara, *Pringle* 11824 (GH, holotype; F, MICH, MSC, US); Calabazas, *Reko* 4868 (US); Mata de Bule, Sierra de los Corales, Mun. de Tecalitlan, 1300 m, *Rzedowski* 17316 (MICH, MSC); Llano Verde, cerca de los Corales, Mun. de Tecalitlan, Sierra de los Corales, 1600 m, *Rzedowski* 17446 (MICH, MSC). VERACRUZ: Orizaba, *Botteri* 494 (GH). MORELOS: Cuernavaca, *Bourgeau* 1215 (F, GH); Huitzilac, *Lyonnet* 819 (US); near Cuernavaca, *Pringle* 11342 (GH, US). STATE OF MEXICO: Temascaltepec, Rincon, *Hinton* 129 (US). MICHOACAN: vicinity of Morelia, Cerro San Miguel, 2200 m, *Arsène* 5302 (US); vers la Huerta, 1950 m, *Arsène* 5439 (US); *Arsène* 6619 (US); Carrindapaz, 2200 m, *Arsène* 6080 (GH, holotype of *E. arsenei*; US); 5 miles N of Patzcuaro, 6300 ft, *Cronquist* 9726 (MICH); W-facing slopes of Cerro de Carboneras above Río Cupatizio, ca 22 km S of Uruapan, *King & Soderstrom* 4809 (US); near Uruapan, 4800 ft, *Pringle* 10099 (F, GH, MICH, MSC, US). GUERRERO: Mina, Chilacayote-Manzito, 1850 m, *Hinton et al.* 14936 (US); 2 km N of Taxco, over road to Amacuzac, 1750 m, *Rzedowski* 21494 (MSC).

Eupatorium choricepalum is a widely distributed, vari-

able Mexican species from which *E. arsenei* cannot be satisfactorily separated. Robinson (1934) distinguished the two species on the basis of the narrower, more acute phyllaries and more diffuse panicle in *E. choricepalum*. From specimens now available, however, it appears that variation in these characters is continuous between the extremes. Notes and sketches preserved in the Gray Herbarium suggest that Robinson used Palmer 857 in 1896 in drawing up his description of *E. choricepalum*, but he designated as type *Pringle* 11824 (misprinted 11924). These two specimens differ principally in the size of the crenations of the leaf margins.

Eight specimens were examined for anther content. One (*Pringle* 11824, MSC) had pre-anthesis florets with anthers which contained few "oil droplets" and many pollen grains of irregular sizes and shapes, a high percentage of which were aborted. Five specimens with pre-anthesis florets had anthers which contained few if any pollen grains and many "oil droplets": *Palmer* 712 in 1886 (MSC); *Pringle* 747 (MSC); *Rzedowski* 17316 (MSC), 17446 (MSC), 21494 (MSC). Two specimens had only post-anthesis florets but an examination of the anthers revealed the presence of "oil droplets" indicative of pollen sterility: *Palmer* 857 in 1896 (MSC); *Pringle* 10099 (MSC).

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